

Effects Of Nighttime Light Radiance On The Sleep Of The General Population

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Abstract:

Introduction: The objectives of this study is to verify if the exposure to greater nighttime radiance is associated with changes in the sleep/wake schedule and with greater sleep disturbances. **Methods:** The target population was the adults (18 years and older) living in California, USA. This represents 24 million of inhabitants. A total of 3,104 subjects participated in the survey (participation rate 85.6%). The participants were interviewed by telephone using the Sleep-EVAL system. The interviews covered several topics including sleeping habits, sleep quality, sleep disturbances, physical symptoms related to menopause. Chronic insomnia was defined as difficulty initiating or maintaining sleep for at least 3 months. Global nighttime light emissions have been collected by the Defense Meteorological Satellite Program's Operational Linescan System (DMSP/OLS) sensors. We extracted the radiance calibrated nighttime lights corresponding to the date of the interviews for a three by three window centered on each coordinate corresponding to an interview address. **Results:** Dissatisfaction with sleep quantity and/or quality was associated with an increased nighttime radiance ($p=0.02$). Similarly, excessive sleepiness accompanied with impaired functioning was significantly associated with an increased nighttime radiance ($p<0.0001$). The association remained significant after controlling for age, gender and use of a night lamp in the bedroom. Confusional arousals were also significantly associated with an increased nighttime radiance ($p< .0001$).

Bedtime hour was linearly increasing with the intensity of nighttime radiance: the later the bedtime, the greater the nighttime radiance ($p<0.0001$). Similarly, wakeup time became progressively later as the nighttime radiance increased ($p<0.0001$). Both associations remained significant after controlling for age, gender and use of a night lamp in the bedroom. Circadian Rhythm Disorders were the only sleep disorder significantly associated with increased nighttime radiance ($p<0.0001$).

Conclusion: Exposure to increased nighttime light radiance appeared to cause a shift in the sleep/wake schedule, excessive sleepiness and Circadian Rhythm Disorders.